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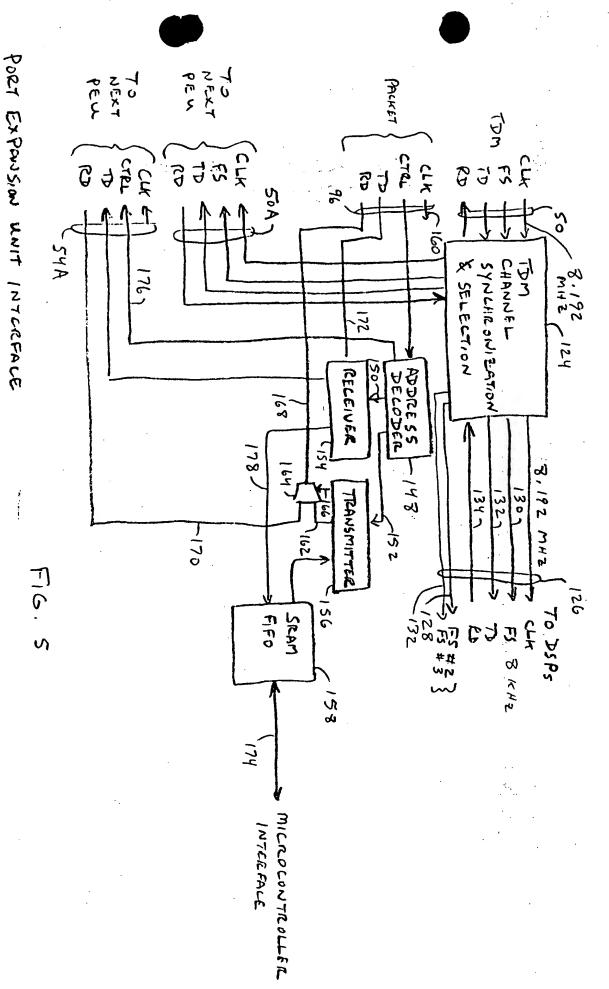
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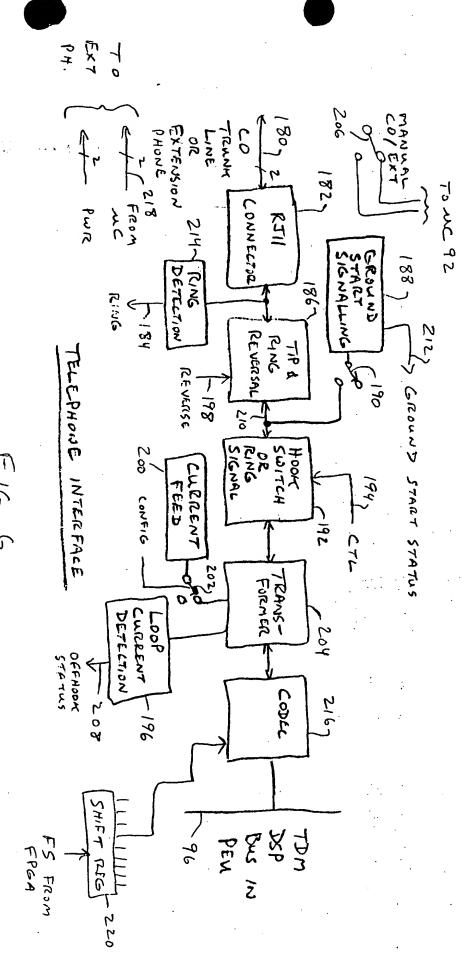
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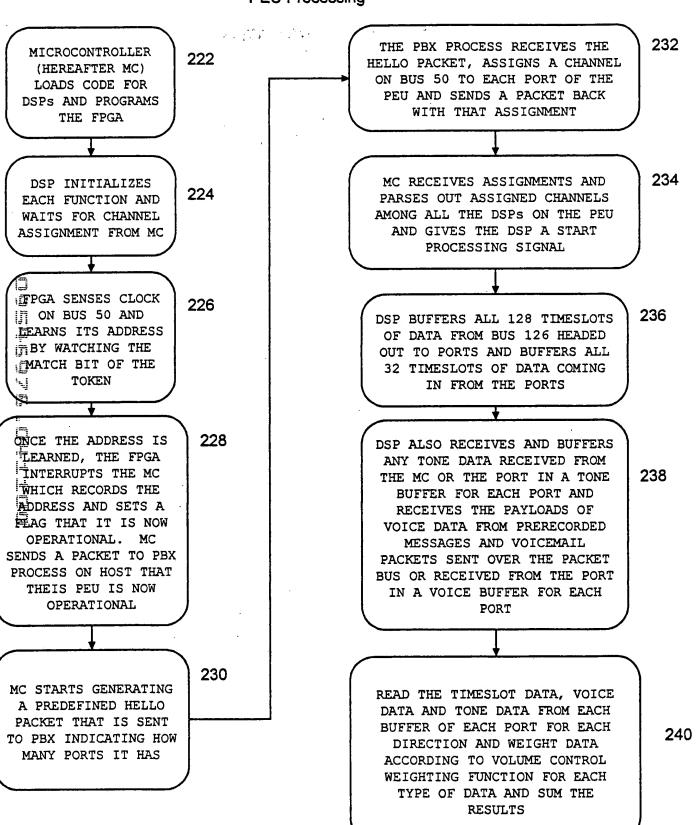


FIG. 7A

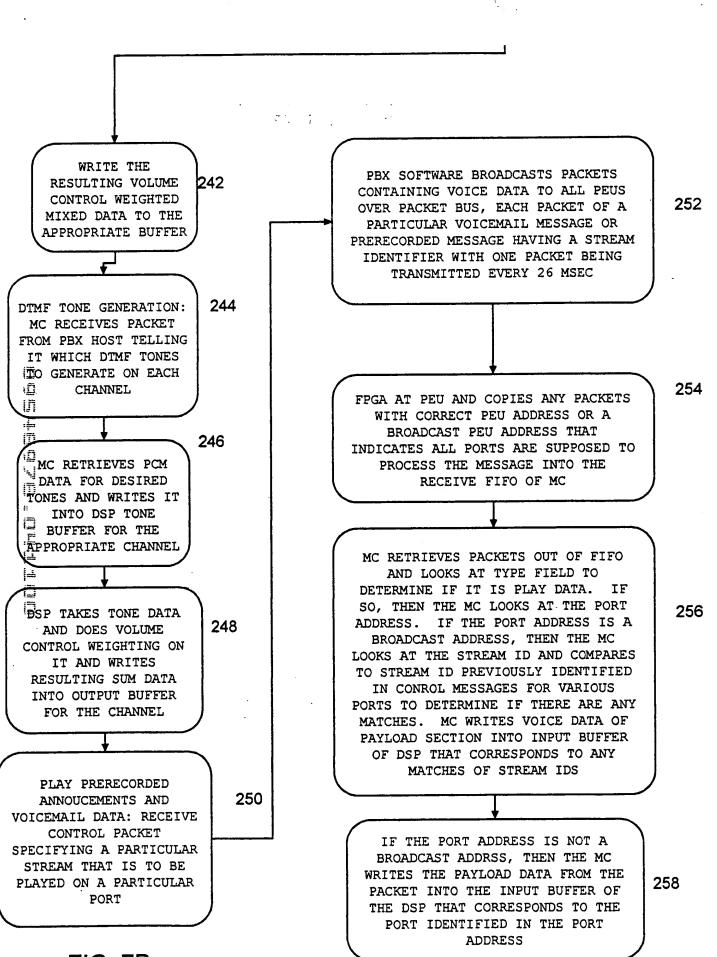
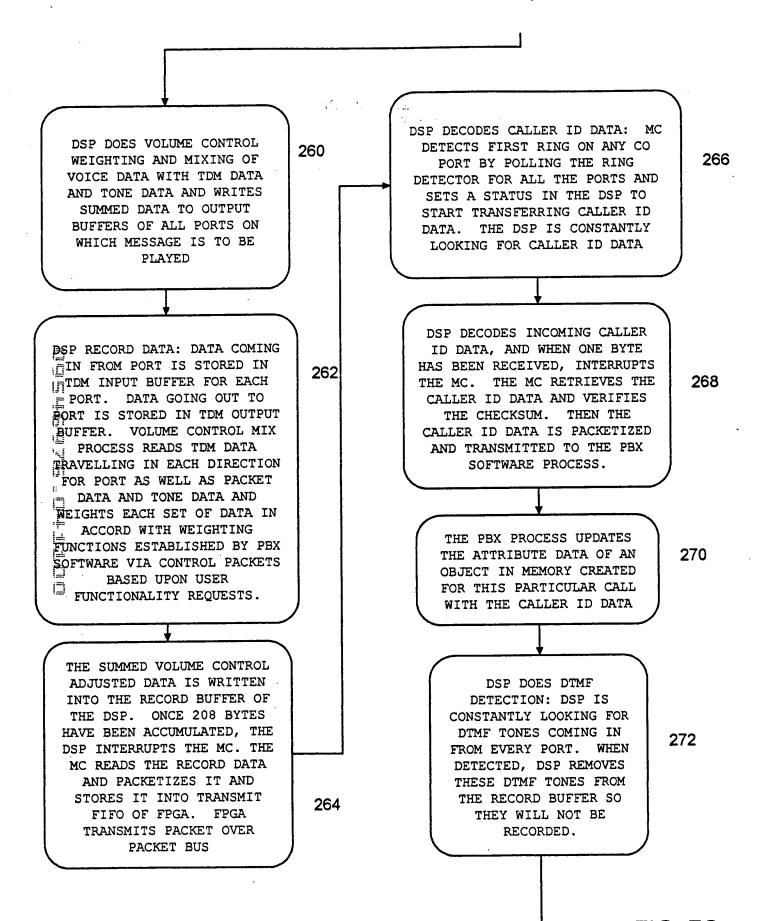
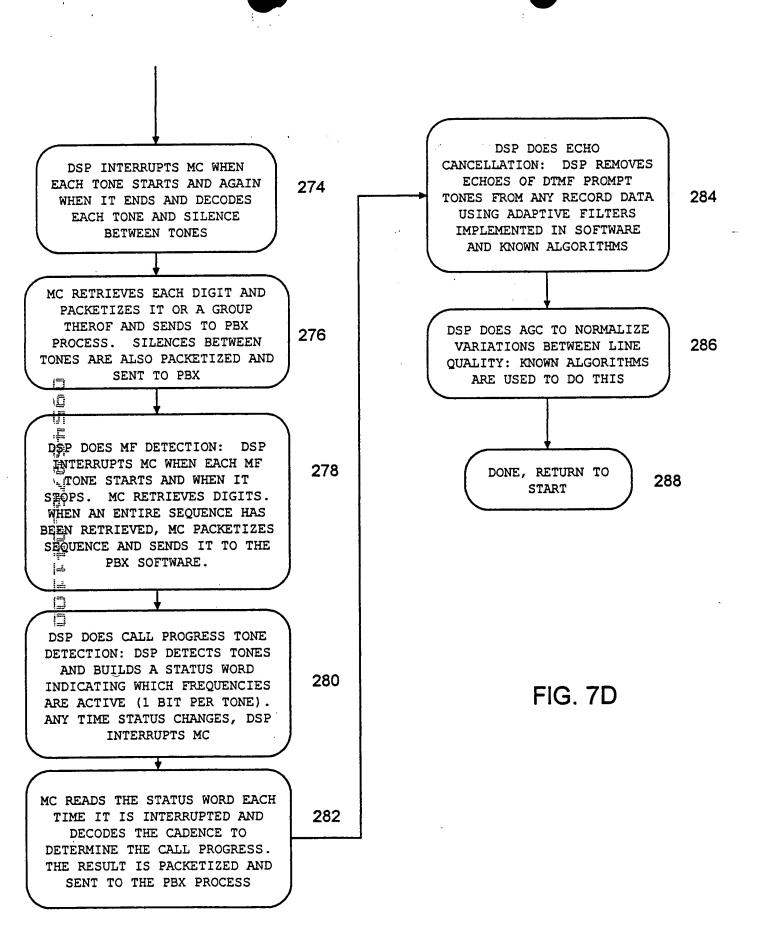


FIG. 7B





MC-TELEPHONE INTERFACE PROCESSING FOR INCOMING CALL

MC RECEIVES CONFIGURATION DATA FROM PBX AT STARTUP AND SEND COMMAND TO DID SWITCH 202 OF EACH PORT TO SET FOR A CO PORT OR EXTENSION PHONE AS APPROPRIATE

MC READS GROUND START/LOOP START CONFIGURATION STATUS AT STARTUP AND SENDS A COMMAND TO SWITCH 190 TO SET IT FOR THE PROPER SIGNALLING PROTOCOL

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MC POLLS LOOP CURRENT DETECTOR EVERY 10 MSEC TO READ STATUS. IF GET 2-3 STATUS WHICH ARE THE SAME, THEN THAT IS CONSIDERED TO BE THE NEW STATUS AND IS REPORTED BY PACKET TO PBX

MC POLLS RING DETECTOR EVERY 2 MSEC. STATUS IS DEBOUNCED AND IS THEN REPORTED BY PACKET TO PBX

MC COMMUNICATES DIGITAL DATA WITH EXTENSION PHONES: DATA TO BE SENT TO PHONE IS GATHERED FROM PACKETS SENT BY PBX. MC POLLS EXTENSION PHONES FOR DATA TO BE SENT BACK FROM PHONE BY ADDRESSING EACH ONE INDIVIDUALLY IN TURN. EXTENSION PHONE RESPONDS TO POLL BY SENDING ANY DATA IT HAS OR AN "ACK, NO DATA" MESSAGE. ANY DATA TO BE SENT TO PHONE IS SENT DURING TIMES WHEN PHONE IS NOT BEING POLLED

IF THE PHONE WHICH WAS POLLED DOES NOT RESPOND FOR N CONSECUTIVE POLLS, THE MC MARKS PCOMM FOR THAT PHONE AS DOWN. ANOTHER PROCESS RETRIES THE DOWNED PORTS EVERY SECOND TO DETERMINE IF THEY HAVE COME BACK THE TABLE OF WHICH UP YET. PORTS HAVE PCOMM STATUS UP OR DOWN IS REPORTED BY PACKETS TO THE PBX PROCESS

PORT CONFIGURATION PROCESS PERIODICALLY READS MANUAL SWITCH 206 OF EACH PORT TO DETERMINE IF THERE HAS BEEN ANY CONFIGURATION CHANGE

IF ANY CONFIGURATION CHANGE HAS HAPPENED, A PACKET IS SENT TO THE PBX PROCESS SIGNALLING THE CHANGED CONFIGURATION.

MONITOR FOR INCOMING DID CALL ON ALL CO PORTS CONFIGURED FOR DID:MC EXAMINES STATUS OF LOOP CURRENT DETECTION AND RING STATUS AND DRAWS CONCLUSION AS TO WHETHER A DID INCOMING CALL IS READY TO BE

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FIG RA

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SENT BY CO

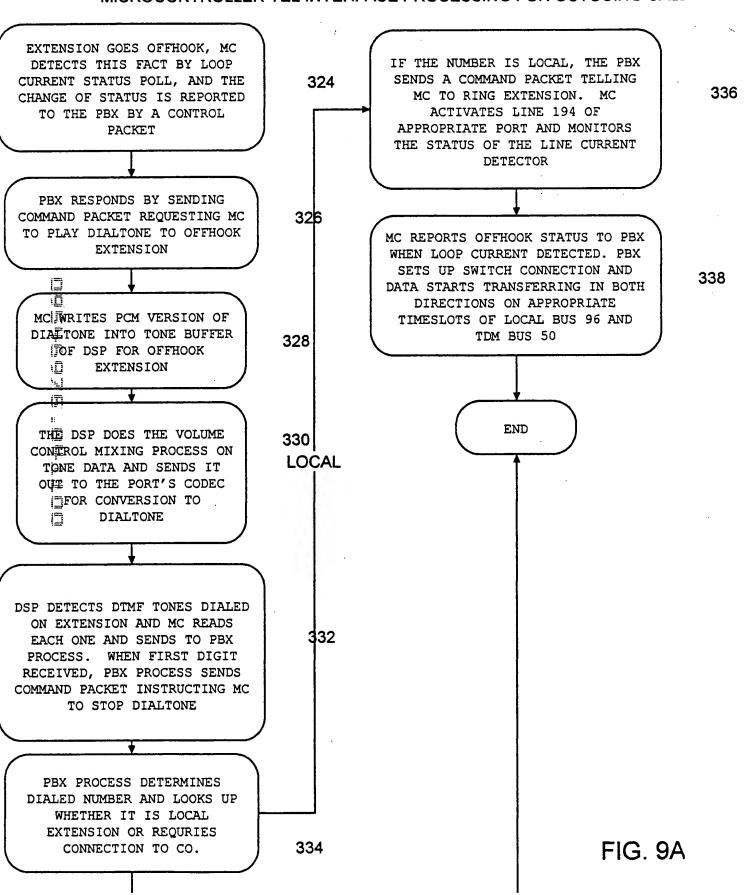
306 WHEN THE MC DETECTS LOOP CURRENT AND NO RING SIGNAL, IT SENDS A COMMAND TO THE TIP AND RING 304 CO SENDS DIALED DIGITS AS DTMF REVERSAL CIRCUIT TO CAUSE IT TO FLIP THE TIP LINE VOLTAGE TONES. DSP DETECTS DTMF TONES POLARITY TO +48 VOLTS RELATIVE TO AND INTERRUPTS MC. MC READS RING TO SIGNAL THE CO THAT THE PBX DIGITS AND PACKETIZES AND SENDS TO PBX PROCESS WAS READY TO RECEIVE THE DIALED THE MC THEN SENDS A DIGITS. CONTROL PACKET TO THE PBX INDICATING A DID CALL IS INBOUND THE PBX PROCESS READS THE DIALED DIGITS OF THE DID CALL AND LOOKS UP THE 308 MC RESPONDS TO CONTROL PACKET EXTENSION THAT IS MAPPED TO THAT DIALED NUMBER AND SENDS BY DEACTIVATING REVERSE COMMAND A COMMAND PACKET TO THE ON LINE 198 TO CAUSE TIP AND 316 APPROPRIATE PEU SAYING 'RING RING REVERSAL CIRCUIT TO SET \square PORT x" TIP AND RING POLARITIES BACK TO NORMAL TO SIGNAL CO THAT EXTENSION PHONE HAS ANSWERED CALL MC ACTIVATES LINE 194 TO RING SIGNAL CIRCUIT 192 TO 310 **ECAUSE IT TO START SENDING** CO STOPS SENDING RINGBACK RING SIGNAL TO EXTENSION 318 TONE TO CALLER AND CONNECTS -NAMED IN CONTROL PACKET AT ANALOG SIGNALS FROM CALLER TO CADENCE GIVEN IN CONTROL PBX PACKET PEU RECEIVES DIGITIZED DATA WHEN THE POLLING OF THE LOOP FROM CO AND ROUTES TO SWITCH CURRENT DETECTOR INDICATES CARD OVER TDM BUS TIMESLOT 320 312 THAT THE EXTENSION PHONE HAS ASSIGNED TO CO PORT WHERE GETS GONE OFFHOOK, MC SENDS A SENT BACK TO THIS PEU OR CONTROL PACKET WITH THAT ANOTHER PEU ON THE TIMESLOT CHANGE IN STATUS TO THE PBX ASSIGNED TO THE EXTENSION **PROCESS** CALLED DSP RECEIVES DATA FROM BUS 50 TIMESLOT ASSIGNED TO CALLED PBX SENDS CONTROL PACKET EXTENSION AND PUTS IN ON THE BACK TO MC SAYING ANSWER 322 TIMESLOT OF THE LOCAL BUS 96 CALL AND SETS UP THE SWITCH ASSIGNED TO THE PORT OF THE CONNECTION BETWEEN THE CO CALLED EXTENSION. VICE VERSA 314 PORT AND THE EXTENSION PORT FOR DATA COMING IN FROM THE

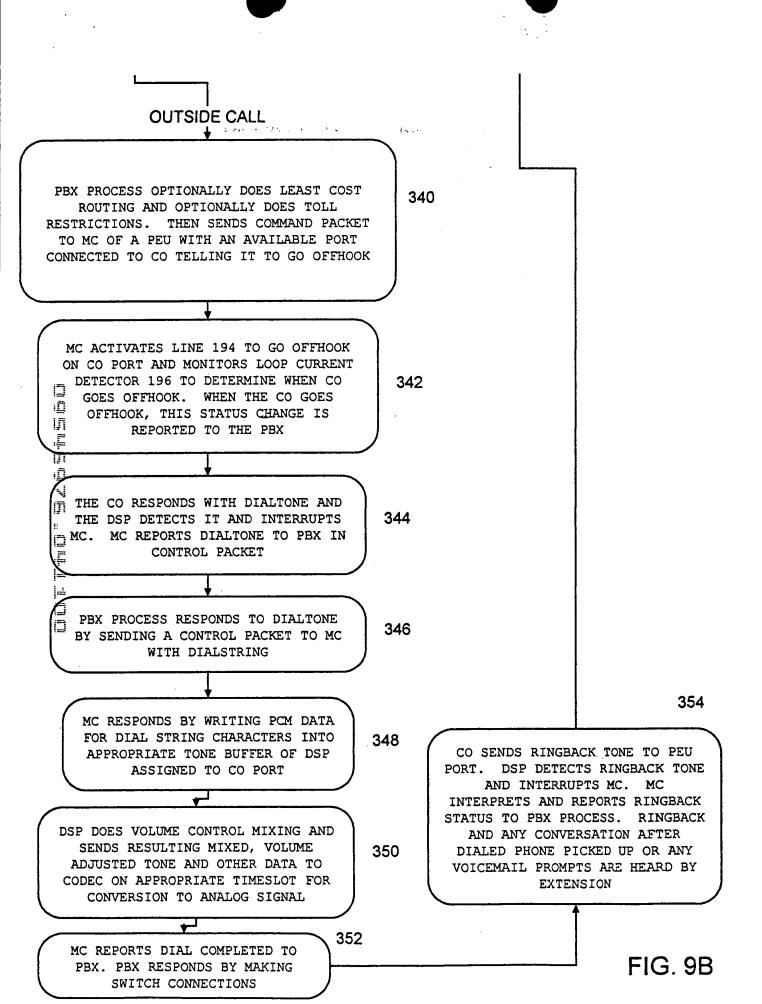
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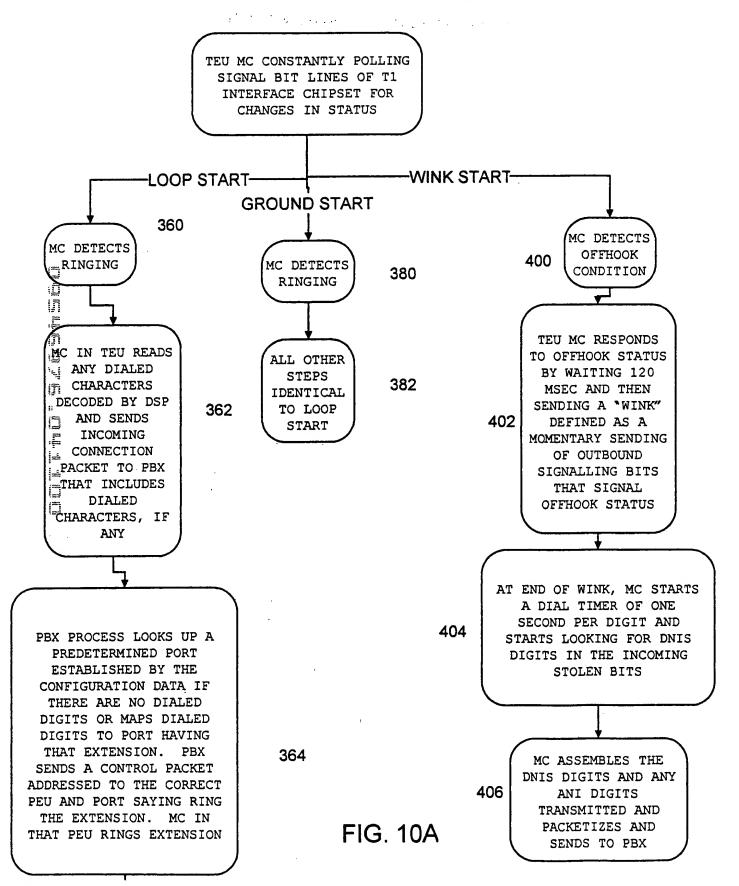
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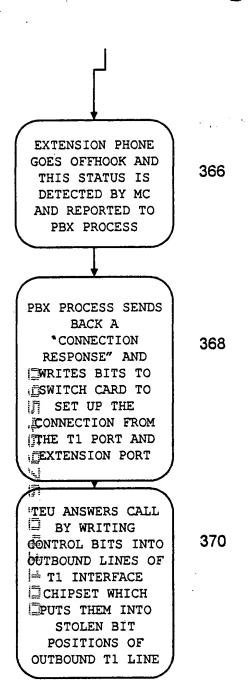
MICROCONTROLLER-TEL INTERFACE PROCESSING FOR OUTGOING CALL



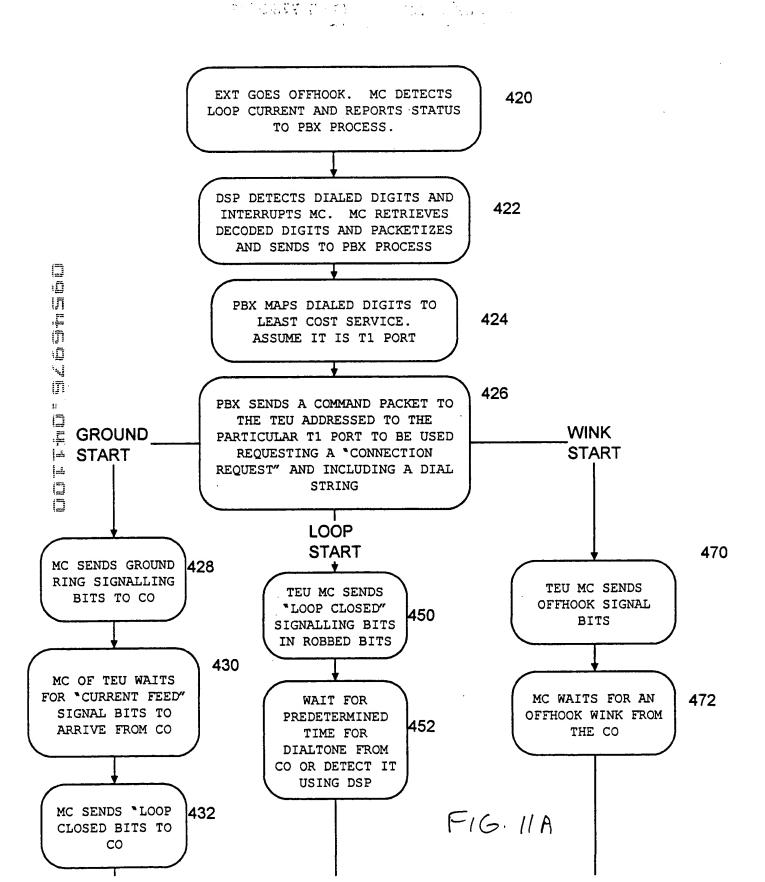


TEU PROCESSING FOR AN INCOMING TIME CALL





T1 TEU PROCESSING FOR OUTBOUND CALL



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SWITCH CARD DSP CONFERENCING PROCESS

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FIRST DSP DOES KNOWN ECHO CANCELLING 472 ALGORITHM ON OUTPUT FOR EACH CONFERENCE, DSP 3 DOES OF FIRST 13 OF 32 TDM VOLUME CONTROL BY CALCULATING CHANNELS DEVOTED TO 480 THE SUM OF ALL DATA IN THE CONFERENCING TIMESLOTS ASSIGNED TO THE CONFERENCE PLUS ANY BEEP TONE USED TO ALERT CONFEREES TO JOINDER BY A NEW CONFEREE SECOND DSP DOES KNOWN ECHO CANCELLING ROUTINE ON OUTPUT OF NEXT 13 OF 474 32 CONFERENCING CHANNELS AND PASSES FIRST 13 AND DSP 3 CALCULATES THE INPUT DATA LAST 6 ON UNCHANGED TO FOR EACH CONFEREE'S CHANNEL SO THE THIRD DSP EACH CONFEREE HEARS ALL THE 482 OTHER PARTICIPANTS BUT DOES NOT HEAR HIS OR HER OWN VOICE. INPUT FOR EACH CHANNEL IS THE THIRD DSP DOES ECHO CONFERENCE SUM MINUS THE OUTPUT CANCELLING ON LAST 6 DATA OF EACH CHANNEL CHANNELS AND THEN DOES 476 AUTOMATIC GAIN CONTROL FUNCTION ON ALL 32 CONFERENCE CHANNELS IN THE CONFERENCE CHANNEL INPUT EACH DIRECTION SO EACH 484 DATA FOR EACH CONFEREE'S PARTICIPANT HEARS THE CHANNEL CALCULATED IN STEP OTHERS AT THE SAME 482 IS MULTIPLIED BY THE APPROXIMATE VOLUME CONFERENCE VOLUME DSP 3 USES CONFERENCE SETUP DATA WRITTEN DSP 3 SENDS THE CALCULATION 478 INTO ITS MEMORY BY RESULTS FOR EACH CHANNEL AS PBX PROCESS TO THE INPUT DATA FOR THAT DETERMINE WHICH CHANNEL. ALL OTHER INPUT 486 CHANNELS BELONG TO DATA FROM THE PEU FOR OTHER WHICH CONFERENCES CHANNELS IS PASSED BY DSP 3 UNCHANGED. DSP 2 AND DSP 1 PASS ALL DATA THROUGH UNCHANGED

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ANALOG LOOP START PROTOCOL PROCESS - CO ORIGINATES CALL

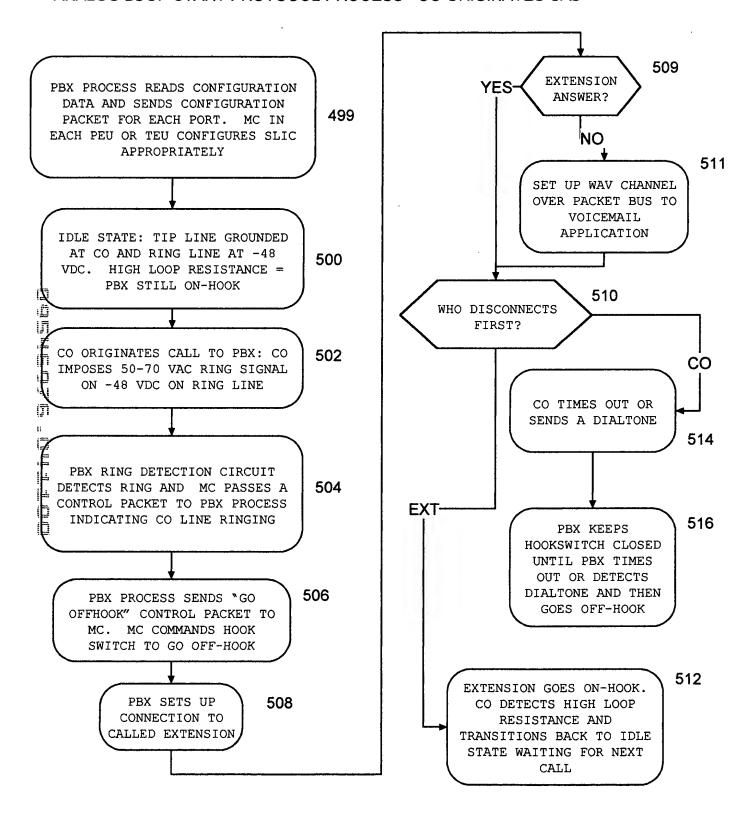
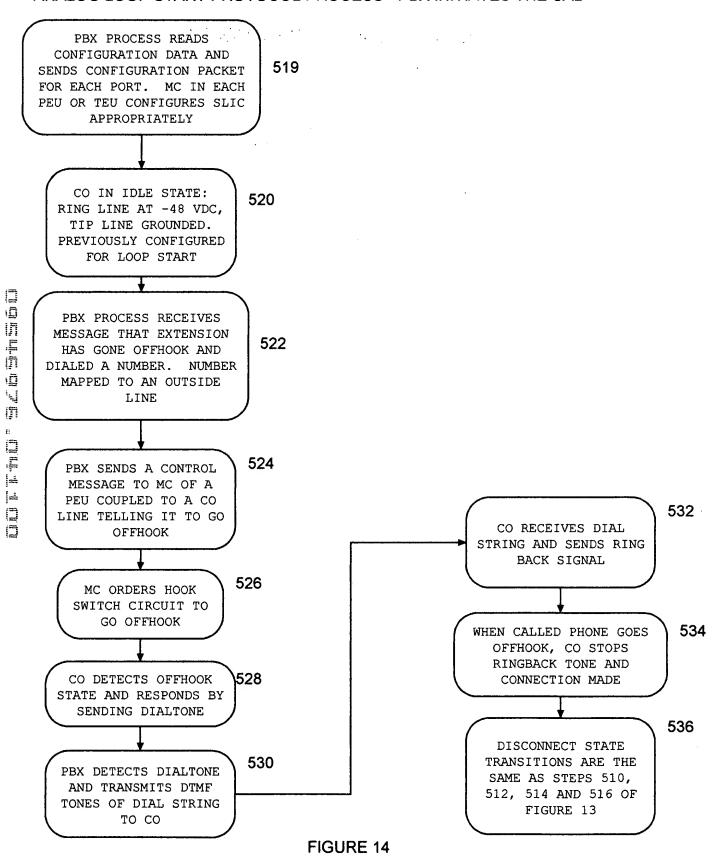


FIGURE 13

ANALOG LOOP START PROTOCOL PROCESS - PBX INITIATES THE CAL



GROUND START SIGNALLING PROTOCOL - ANALOG CO LINE - CO ORIGINATES CAL

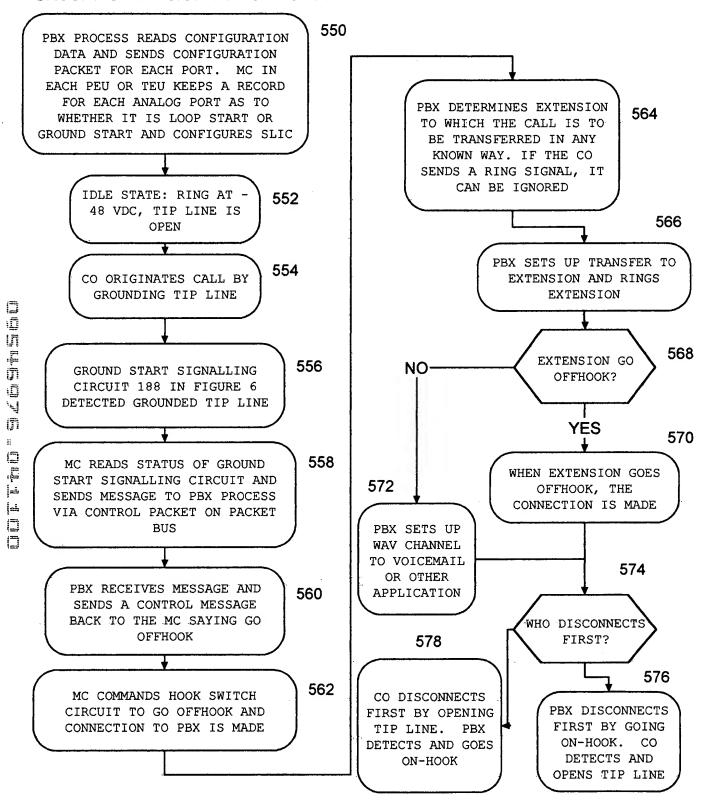


FIGURE 15

GROUND START SIGNALLING PROTOCOL - ANALOG CO LINE - PBX ORIGINATES CAL

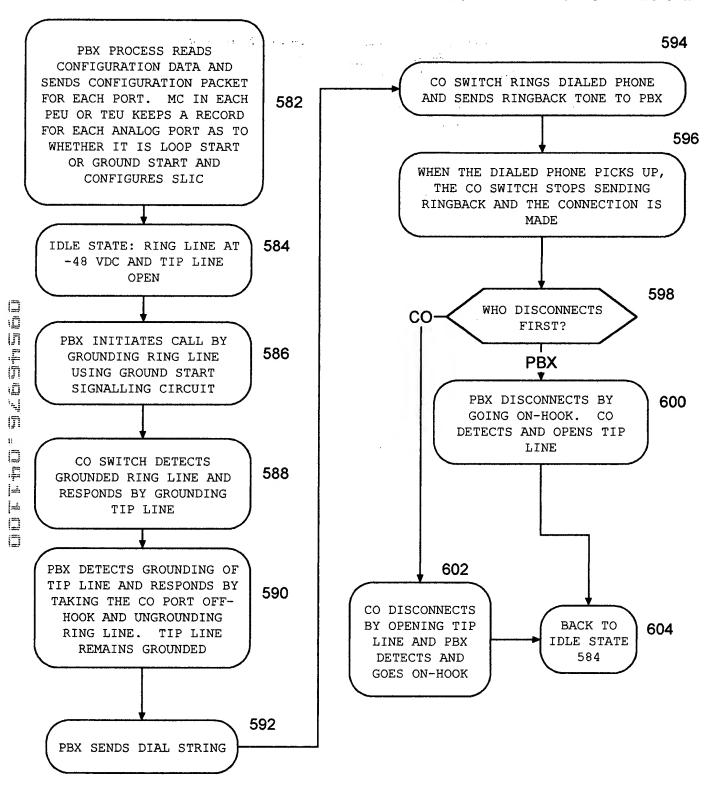


FIGURE 16

